United Nations Economic Commission for Africa

Renewable Energy Policy & Regulatory Framework for Enhanced Coherence of NDCs in Africa

Ghana Experience

By

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COP PARIS AGREEMENT – GHANA'S NATIONALLY DETERMINED CONTRIBUTIONS (NDCS)

- Ghana's emission reduction goal is to unconditionally lower its GHG emissions by 15 percent relative to a business-as-usual (BAU) scenario emission of 73.95MtCO2e 2 by 2030.
- An additional 30 percent emission reduction is attainable on condition that external support is made available to Ghana to cover the full cost of implementing the mitigation action
- With this external support, a total emission reduction of 45% below the BUA emission levels can be achieved by 2030.

Mitigation Policy Actions – 20 Programmes

Sectors	INDC Policy Actions	No. of Programme of Actions
Energy	Scale up renewable energy penetration by 10% by 2030	5
	Promote clean rural households lighting	1
	Expand the adoption of market-based cleaner cooking solutions	2
	Double energy efficiency improvement to 20% in power plants	1
Transport	Scale up sustainable mass transportation	1
AFOLU	Promote Sustainable utilization of forest resources through REDD+	5
Waste	Adopt alternative urban solid waste management	3
Industry	Double energy efficiency improvement to 20% in industrial facilities	1
	Green Cooling Africa Initiative	1

Source : *COP PARIS AGREEMENT – GHANA'S NATIONALLY DETERMINED CONTRIBUTIONS (NDCS)*

Annex 1: Mitigation Policy Actions and emission reduction actions[11]

INDC Policy Actions	Programme of Action	Supporting national policy & measures	Status
Scale up renewable energy penetration by 10% by 2030	Increase small-medium hydro installed capacity up to 150-300MW	• National Energy Policy • National renewable energy Act (Act 832). • Set up feed-in-tariff for renewable energy technologies. • Established of national renewable energy fund • Design renewable energy purchase obligation. • Net metering scheme for households	Conditional
	Attain utility scale wind power capacity up to 50-150MW		
	Attain utility scale solar electricity installed capacity up to 150-250MW		
	Establish solar 55 mini-grids with an average capacity of 100kW which translates to 10MW		
	Scale up the 200,000 solar home systems for lighting in urban and selected non-electrified rural households		
Promote clean rural households lighting	Increase solar lantern replacement in rural non-electrified households to 2 million.	• Sustainable Energy Action Plan • National bioenergy strategy • Phasing out fossil fuel subsidies	

Source : *COP PARIS AGREEMENT – GHANA'S NATIONALLY DETERMINED CONTRIBUTIONS (NDCS)*

Annex 1: Mitigation Policy Actions and emission reduction actions[11]

INDC Policy Actions	Programme of Action	Supporting national policy & measures	Status
Expand the adoption of market-based cleaner cooking solutions	Scale up adoption of LPG use from 5.5% to 50% peri-urban and rural households up to 2030.	• Sustainable Energy Action Plan • National Natural Gas Master Plan. • National LPG Programme	Conditional
	Scale up access and adoption of 2 million efficient cook stoves up to 2030		
Promote Sustainable utilization of forest resources through REDD+	Continue 10,000ha annual reforestation/afforestation of degraded lands	National Forest and Wildlife Policy.	Unconditional
	Double 10,000ha annual reforestation/afforestation of degraded lands translating to 20,000ha on annual basis.	National plantation development strategy	Conditional

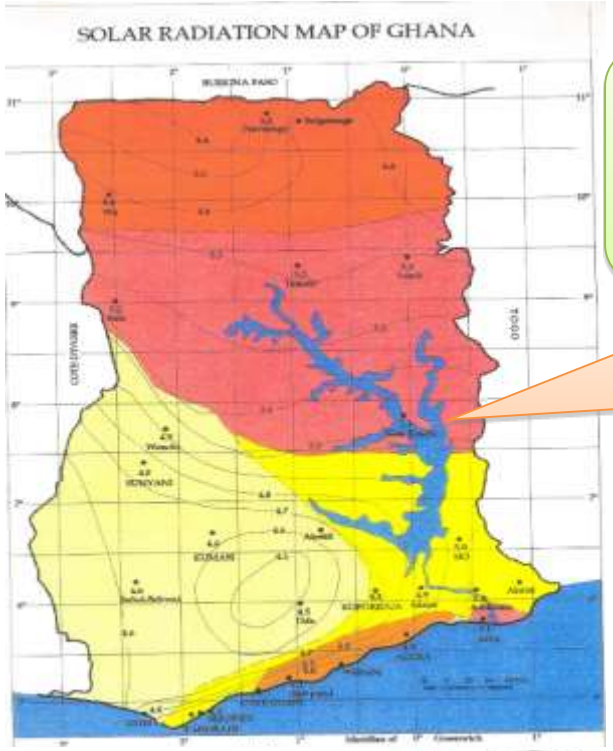
Source : *COP PARIS AGREEMENT – GHANA'S NATIONALLY DETERMINED CONTRIBUTIONS (NDCS)*

Development of Regulatory Framework

The main enabling instruments comprise:

- The Renewable Energy Act, 2011 (Act 832);
- Renewable Energy Sub-Code for National Interconnected Transmission System connected Variable Renewable Energy Power Plants in Ghana;
- Renewable Energy Sub-Code for Distribution Network connected Variable Renewable Energy Power Plants in Ghana;
- Net Metering Sub-Code for Connecting Renewable Energy Generating Systems to the Distribution Network in Ghana;
- Feed-in-tariff for electricity generated from RE sources;
- Guidelines and modalities for the Renewable Energy Purchase Obligation (REPO); and
- Standardised Power Purchase Agreement Template.
- Renewable Energy Master Plan (Draft 2018)

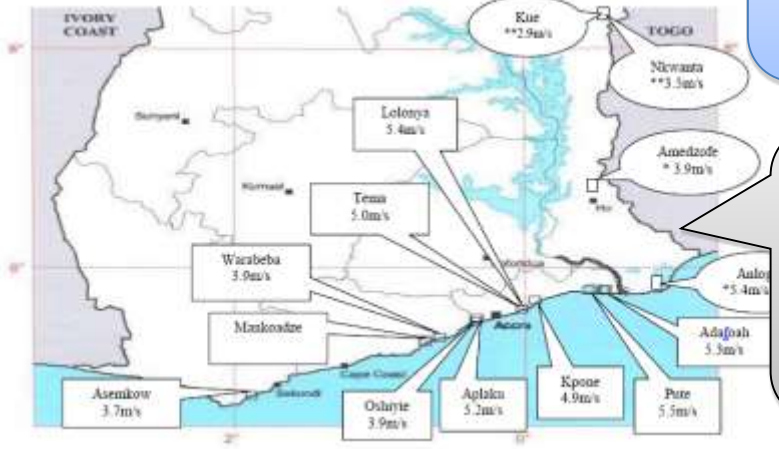
Renewable Energy Resource Potential



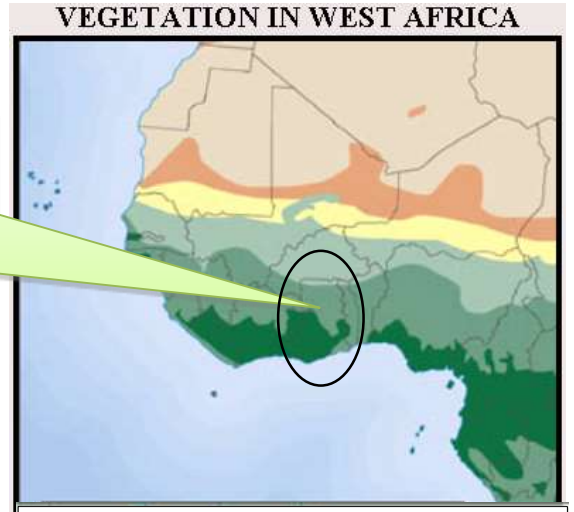
Ghana has high potential for energy crops, forest and crop reside for electricity generation

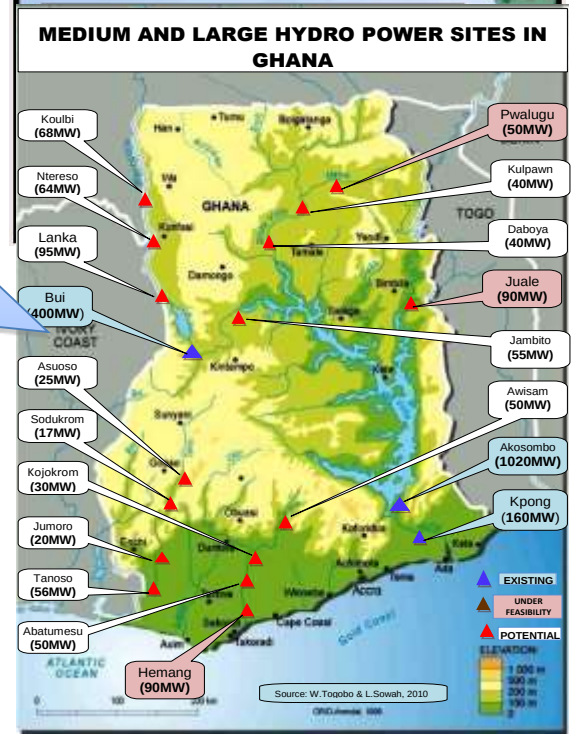
High solar irradiation 4-6kWh/m²/day to support grid and off-grid electrification

Ghana has over 14 potential hydro sites with total capacity of 740MW yet to be exploited.



High Wind power potential along coast. Data collection at 60m & 80m height underway in 13 sites.





- Until the late 1980s, renewable energy in the form of hydro power accounted for more than 90% of Ghana's total electricity generation
- As at December 2015, the contribution of renewable energy in the energy mix had declined to about 43.2% of total installed electricity generation capacity.
- Contribution from solar resource including stand-alone off-grid solar systems accounts for just about 1,2%.
- It is our Policy to increase RE penetration by 10% by 2030

REMP IMPLEMENTATION PLAN - RE TARGETS UP TO 2030

Renewable Energy Technologies	Reference 2015		Cycle I (2018-2020)		Cycle II (2021-2025)		Cycle III (2026-2030)	
Utility Scale RE	No. of units	MWp	No. of Units	MWp	No. of Units	MWp	No. of Units	MWp
Solar Utility Scale	-	23	-	293	-	495	-	873
Wind Utility Scale	-	0	-	125	-	400	-	650
Biomass Utility-Scale	-	10	-	70	-	175	-	300
Waste-to-Energy Utility Scale	-	0.1	-	3.5	-	15	-	30
Small/Medium Hydro Plants	-	0	-	0.03	-	108	-	340
Wave Power	-	0	-	10	-	25	-	115
Distributed Solar PV (Net Metering)	2,000	2	20,000	20	120,000	120	200,000	200

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Renewable Energy Technologies	Reference 2015		Cycle I (2018-2020)		Cycle II (2021-2025)		Cycle III (2026-2030)	
Off-Grid RE Electrification	No. of units	MWp	No. of Units	MWp	No. of Units	MWp	No. of Units	MWp
Mini/Micro-grids RE hybrid	13	-	80	3.2	200	8	300	12
Standalone Wind Systems	-	0	-	0.1	-	1	-	2
Standalone Solar Home Systems	-	3	7,000	4.5	-	8	-	14
Solar Street/Community lighting	-	5	-	7	-	11	-	25
Solar Traffic Lights (% of total traffic lights installed)	4	-	25	-	40	-	60	-
Solar irrigation	150	2	4,400	8.8	26,400	52.8	48,800	100
Wind Irrigation/Water Pumping	10	0	35	-	65	-	100	-
Solar Lanterns	72,000	-	200,000	-	500,000	-	1,000,000	-

REMP IMPLEMENTATION PLAN - RE TARGETS UP TO 2030

Renewable Energy Technologies	Reference 2015		Cycle I (2018-2020)		Cycle II (2021-2025)		Cycle III (2026-2030)	
Other RE Enduse Technologies	No. of units	MWp	No. of Units	MWp	No. of Units	MWp	No. of Units	MWp
Solar Crop Dryers	70	-	150	-	400	-	700	-
Solar Water Heaters	4,700	-	20,000	-	70,000	-	135,000	-
Biogas (Agricultural/Industrial Organic Waste)	10	-	30	-	100	-	200	-
Biogas (Institutional)	100	-	180	-	320	-	500	-
Biogas (Domestic)	50	-	80	-	130	-	200	-

REMP IMPLEMENTATION PLAN - RE TARGETS UP TO 2030

Renewable Energy Technologies	Reference 2015		Cycle I (2018-2020)		Cycle II (2021-2025)		Cycle III (2026-2030)	
Solid Biomass & Woodfuel Sector	No. of units	MWp	No. of Units	MWp	No. of Units	MWp	No. of Units	MWp
Woodlot Cultivation	190,000	-	250,000	-	350,000	-	428,000	-
Charcoal (Local Demand)	1,551,282	-	1,645,299	-	1,739,246	-	1,840,123	-
Charcoal (Export)	190,450	-	250,000	-	350,000	-	428,000	-
Briquetting/Pelleting	19,700	-	40,000	-	65,000	-	100,000	-
Biofuel	0	-	100	-	5,000	-	20,000	-
Improved Biomass Cookstove (Domestic)	800,000	-	1,300,000	-	1,800,000	-	3,000,000	-
Improved Biomass Cookstove (Institutional/ Commercial)	1,800	-	3,000	-	10,000	-	18,000	-

Three Utility Scale Power Plants currently in operation

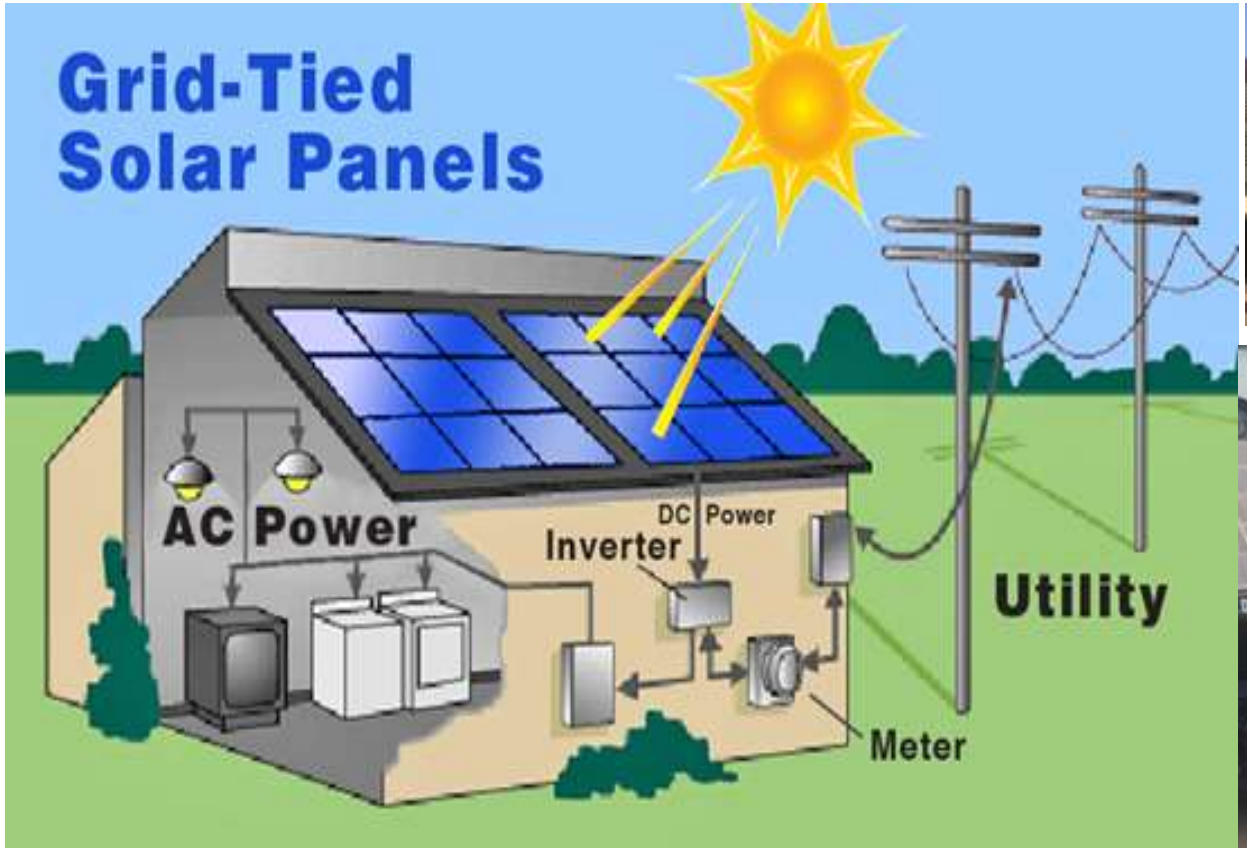
- 2.5MW VRA Solar at Navorongo
- 20MW BXC Solar farm at Onyadzi (near Winneba)
- 100KW Safisana Waste-to-Energy Power Plant at Ashiaman.

The policy is to encourage investment as Independent Power Producer (IPP) through a Power Purchase Agreement competitively procured – Shift from Feed-in-Tariff

Distributed Renewable Energy Generation (DREG)

200,000 Solar Roof Top programme being implemented by the Energy Commission.

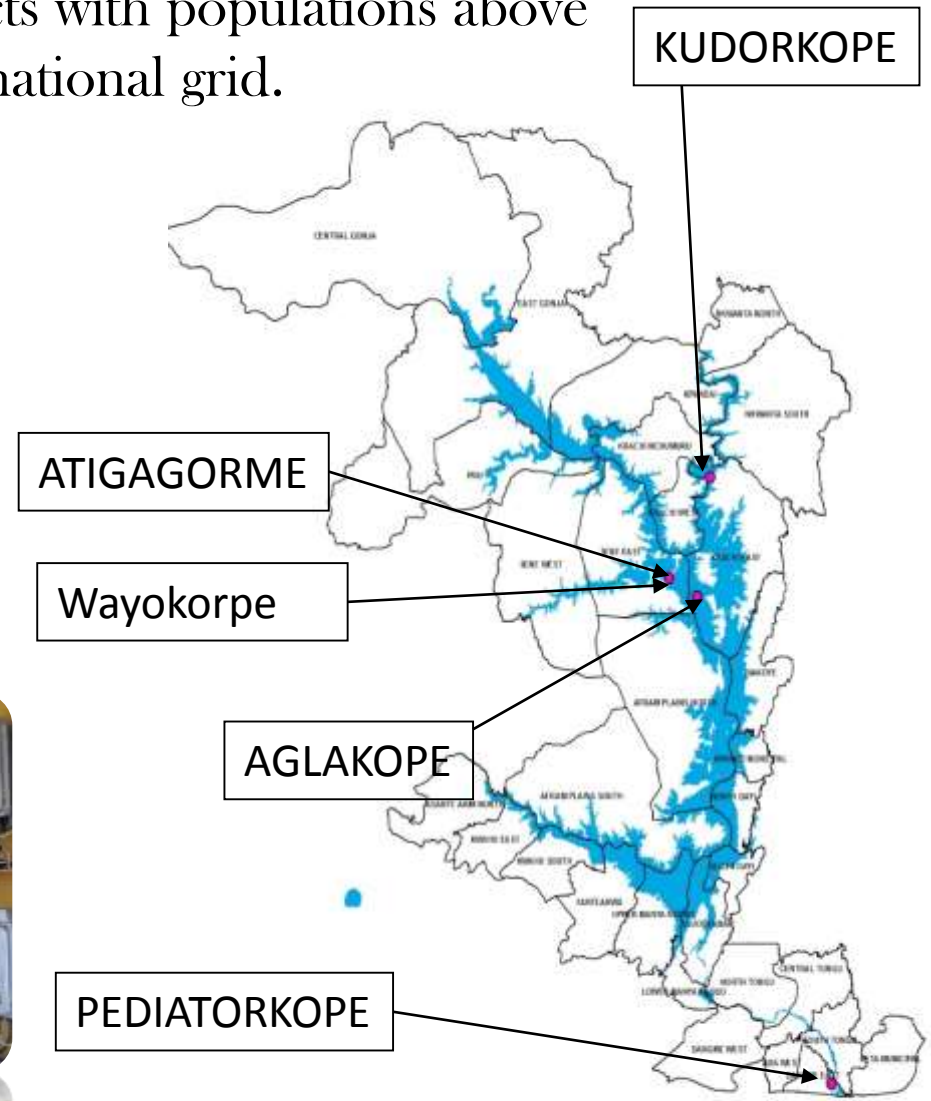
50KWp Solar Park at the Ghana Ministry of Energy



The Policy mandates public buildings and all petroleum product dealers to incorporate to incorporate DREGs to meet a minimum of 5-10% of their energy demand.

Mini-grid Renewable Electricity

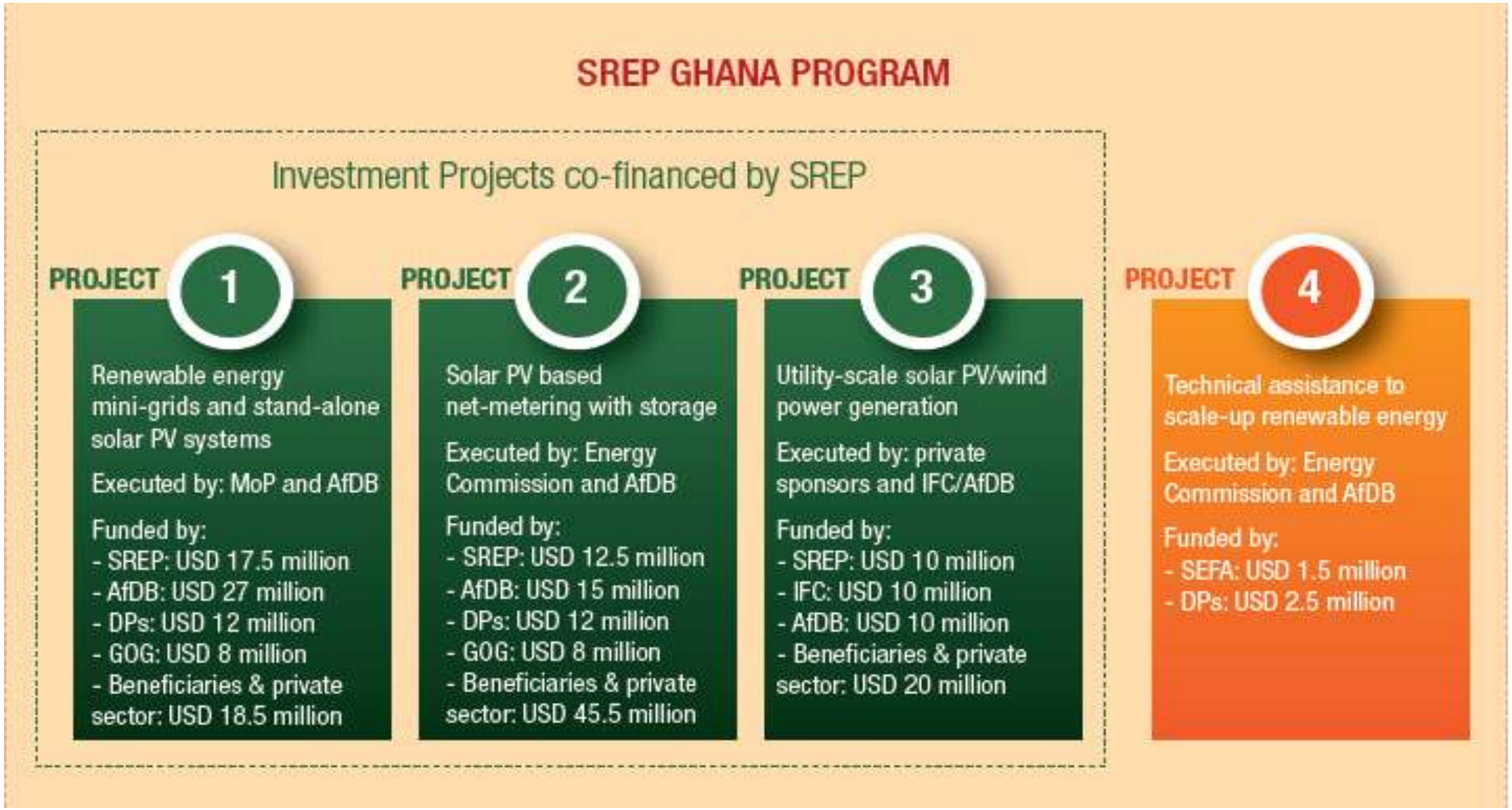
There are over 2,000 communities along the Volta lake in 23 Districts with populations above 1000 inhabitants that are not likely to be immediately connected to national grid.



Mini-grid systems has been considered an integral part of the rural electrification scheme and therefore public sector led – Uniform Pricing Tariff

Decentralised Off-grid Renewable Electricity Systems

SCALING-UP RE PRGRAM (SREP)



SREP TARGETS - (2017-2021)

Expected results-Project 1

- Estimated 55 renewable mini-grids
- Private sector investment in stand-alone solar PV systems to benefit 33,000 households
- About 1,350 schools, 500 health centres and 400 communities electrified

Expected results-Project 2

- 15,000 grid connected solar PV systems with storage capacity
- Financing facilities and instruments
- Standard contract between utilities and customers
- Technical studies
- Service provider-certification and training

Expected results-Project 3

- 150MW Ayitepa/Upstream wind project (IFC/WB structured)

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CLIMATE INVESTMENT FUNDS

Kerosene Lantern Replacement Program

- Target is to replace kerosene lamps with the deployment of both solar and battery operated lanterns to power LED lamps.
- Over 140,000 solar lamps have been deployed and the private sector has taken up
- Subsidy on Kerosene has been removed and kerosene consumption for lighting has drastically reduced.

Other (Non Electricity) Renewable Energy Technologies

- This context refer to technologies that provide end-use services not related to electricity. These include solar water heaters, solar and wind for water supply (for both consumption and irrigation), solar dryers, biogas systems (for cooking and heating) and biofuels (transportation and heating).
  - ✓ *to ensure that new Hotels and Guest Houses are mandated to install solar water heaters to meet a minimum 25 % of their energy requirement for water heating. Hybrid systems, using both electricity and solar, shall be promoted.*
  - ✓ *to create awareness of the financial, economic and health benefits of using solar crop dryers, and support R&D of models using locally available materials to reduce installation cost*
  - ✓ *to promote further research in the use of biofuels for cooking and vehicular use in accordance with the bioenergy strategy*

Solid Biomass and their end-use Technologies

Solid Biomass and Their end-use Technologies

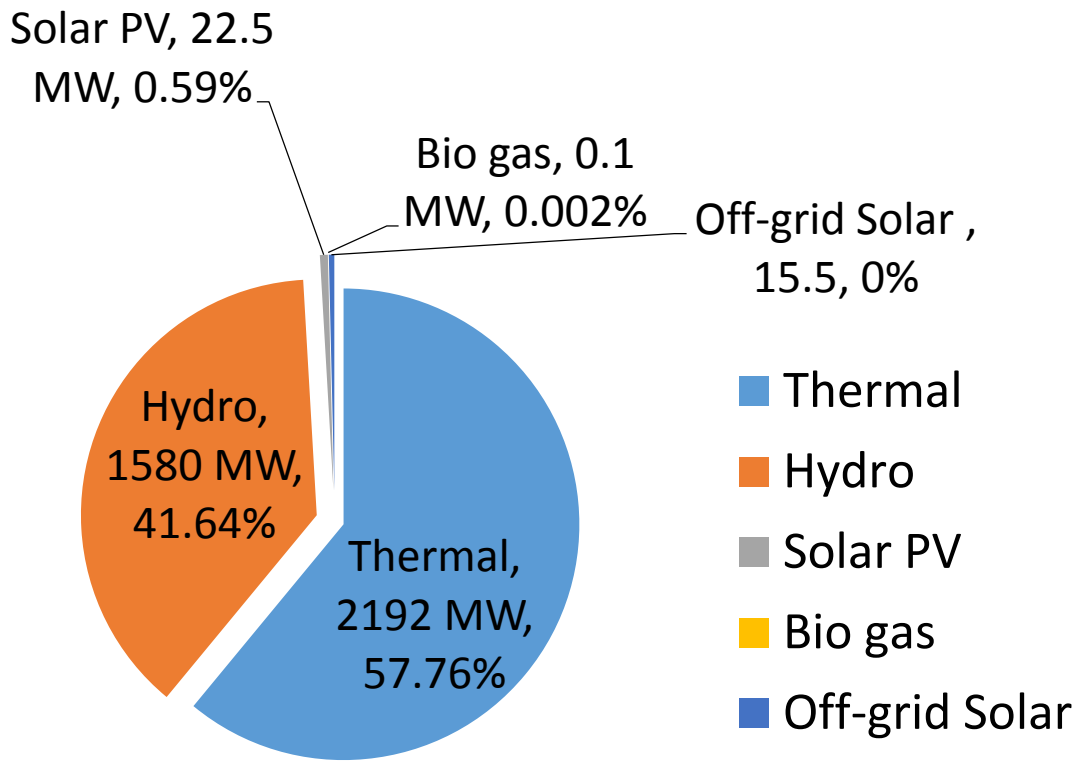
- This context includes traditional cooking fuels such as firewood and charcoal, as well as more modern forms such as pellets and briquettes. End use technologies are the devices used to burn solid biomass.
  - ✓ *In order to reduce deforestation, government shall support the development of community woodlots for the production of firewood, charcoal and pellets/briquettes for domestic, industries (industrial boilers) and other commercial interventions*
  - ✓ *Government shall encourage local production/assembly of stoves that use pellets and briquettes.*

Final Energy Consumption

	2011		2015		% Increase
	KTOE	%	KTOE	%	
Petroleum Products	2,904.52	35.7%	3,543.80	49.5%	22%
wood	3,742.51	46.0%	1,574.70	22.0%	-58%
Charcoal	748.50	9.2%	1,210.00	16.9%	62%
Electricity	683.42	8.4%	829.00	11.6%	21%
	8,135.90		7,157.50		

Source: extracted from EC - Ghana Energy Statistics 2010-2015

Total Installed Capacity - 2016



Total Installed capacity = 4147.5 MW

- More than 70% of energy is lost in the conversion from wood to charcoal. A further 70-80% is lost through inefficient cookstoves.
- Unfortunately the trees which are expected to be carbon sinks are being cut for firewood and charcoal in an unsustainable manner

Way Forward – Ensuring Clean Cooking

- Ensure sustainable supply and access to cleaner and affordable cooking fuels and their enduse devices
- To encourage those that can afford to shift to cleaner fuels such as LPG, biogas etc.
- Support and encourage the poorer majority that cannot afford cleaner fuels to use the local energy resources in an efficient and sustainable manner using modern methods (improved technologies and techniques)

CONCLUSION

- Ghana is committed to delivering on the NDC policy actions under the Paris Agreement
- Ghana is on course to achieving the targets set under the Scaling up Renewable Energy Policy actions
- However the impact as far as CO2 emission reduction may be just moderate.
- What is key is to reducing CO2 emission will the promotion of sustainable utilization of forest resources and the expansion of cleaner cooking solutions (technologies and techniques) to achieving the following additional benefits.
  - 39,500 hectares of woodland is saved from degradation.
  - Reduction in indoor pollution resulting from wood fuel usage.
  - Reduction in smoke related respiratory and eye diseases
  - Reduction in household cooking fuel expenditure
  - Job creation through the manufacture and sale of the efficient stoves
  - Biodiversity conservation
- Investment need for the clean cooking and forest restoration actions is estimated at US$3billion
- Unfortunately this sector receives minimum attention by Governments and international bodies.
- Ghana will embrace and support South - South Cooperation

THANK YOU

Acknowledge the immense support of the Development partners such as the WB-GEDAP, Spain, SECO, AfDB, USAID, JICA, China, Denmark, USAID, Germany among other.